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# ANCIENT ASTRONOMY AS THE MIRROR OF THE HISTORY OF CULTURE

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The history of astronomy is a field where a natural scientist and a historian can cooperate effectively as only the former is an expert in astronomical information contained in ancient sources while the latter understands specific “languages” of ancient cultures.

**KEY WORDS** Ancient astronomy, constellations, history of culture, mythology

Spherical astronomy is a paradoxical science. On the one hand, it undoubtedly belongs to the natural sciences as the object of its investigations are real celestial bodies and objective laws of their transit (movement). On the other hand, in practice, an astronomer deals with notions of the “structure”, “composition” of the starry sky – of the constellations it is composed of. The notions themselves – a group of stars forming constellations and the names of celestial bodies which up to the present are an actual conceptual mechanism and an instrument of astronomy, and therefore are of interest not only in view of the history of formation and development of astronomy as science, came into existence at the centre of the general system of ancient men’s perception of the world, and in this respect these notions can be referred to culture and not nature. Now were these notions formed?

“Opening up” (“Discovering”) the starry sky by ancient people, the learning of constant and variable characteristics of the position of one or another heavenly body regarding both the point of observation and its neighbouring encirclement (including the grouping of these bodies in some structures-constellations) had been connected since ancient times (antiquity) with different aspects of humans social being and thought, and in earlier times were linked closer. A considerable extent of ancient man’s dependence on natural phenomena, first of all his household activities being closely connected with the annual cycle of the seasons, made the task of clear perception of the periodicity of seasonal change very urgent. Of no less significance was an ability to predict the approach of one or another season with the necessary accuracy. It seems certain that the initial phenomenon was the repeating rhythm of seasonal changes – the temperature, working conditions of rivers, vegetation cycle, etc. However, this rhythm is rough enough in any climatic zone since it can have

errors, i.e. with more or less considerable deviations in both aspects. Therefore, these changes cannot serve as absolute calendar bench-marks. Man felt the need of a more reliable instrument for his household calendar very early, the need for which was repeatedly increased in the transition to a productive economy.

Since ancient times an orientation in space had been very important to man also, including the orientation not only within the limited loci where the problem could be solved by means of specific local objects such as a particular-shaped tree, a noticeable stone, a nearby mountain and so on, but in much larger area and even little known or unknown areas (territories). This need gave rise to the idea of four parts (directions) of the world. This idea had been universal for all cultures since ancient times. According to E. Cassirer, "perhaps there is no cosmology, however primitive, in which the contrast of four main directions does not in some way emerge as the cardinal point of its understanding and explanation of the world" (Cassirer, 1955).

The observation of the visible transit of celestial bodies, the understanding of the conformity to natural laws of this transit and its periodicity contributed to the effective solution of the two above-mentioned problems – the structurization of time and space with the purpose of facilitating the orientation in them. Thus the initial stimulus to the understanding of these natural laws which had merely pragmatic roots induced men to understand quite a complicated set of natural phenomena and their interrelations.

At the same time, the marked dependence on nature and accordingly on the dome of the sky "informing" a man about its future conduct caused a high degree of mythologizing of all notions concerning the sky arrived at from both the positive knowledge and lacunae in this knowledge. This led to the perception of the sky as a powerful factor predetermining people's fortunes and finally as the home of gods. Under these prevailing conditions the mythological thoughts concerning the image of the sky played a key role in the whole system of ancient people's ideas of nature and society. In particular, the whole of ancient astronomy is a reflection of mythology created by its peoples. In ancient men's notions of celestial bodies and laws of their transit, links of their cosmic and terrestrial rhythms positive knowledge and mythology are inseparable. Not a single ancient culture can be understood without studying all these notions and the methods of their realization.

The main task of archaeoastronomy as an interdisciplinary field of science is the reconstruction of the history of the formation of astronomical knowledge and the methods of its adaptation by culture. The history of the formation of notions of the structure of the starry sky is a field where natural scientists and humanists can cooperate effectively as only the former are experts in astronomical information contained in the ancient monuments, while the latter understand the specific character of ancient cultures and their "language" and are able to decode the information and "to read" ancient texts for their astronomical contents. In addition, only specialists in the history of culture can manage to reveal the monuments in which these ideas are reflected and can understand the methods for decoding the corresponding information.

The phenomenon of specialized astronomical texts proper belongs to a rather late period. It appeared at the stage of cultural differentiation. Quite a wide-

spread error among those historians who in their studies rely primarily on written sources is the opinion that the lack of information about one or another astronomical phenomenon, celestial bodies, constellations, etc. in such texts indicates that the authors of these texts did not know the information or at least these facts were irrelevant for the given culture. Meantime, such an approach ignores the fact that at the early stages of human history astronomical data and ideas (like any ideas of that period) did not exist in isolation, did not make up an autonomous field of knowledge but penetrated into different aspects of social existence and by means of reciprocal recoding correlated with other aspects of their understanding of the world within the framework of a completely mythological picture of the world based on the conception of isomorphism of all aspects of the universe (Meletinsky, 1976). Therefore, the system of views of the world (including the sum of positive knowledge assimilated) inherent in one or another ancient culture can be understood only on the basis of extensive cultural-historical reconstruction resting not only on verbal texts but the entire complex of monuments left by it, see, for example, Antonova (1984). Under the circumstances the "astronomical code" was one of several equal methods of representing this system and partly remained in contemporary astronomy and only in due course changed into an independent sign system. The above-mentioned significance of astronomical information in the life of ancient man makes it possible to suppose the existence of a great number of monuments in which this information is somehow reflected. The nature and character of such monuments is very diverse. Different structures (the most striking example is the well-known Stonehenge), rituals, figurative and ornamental compositions of different contents, etc. can be referred to their number. At the same time, on one hand, the use of a conventional-symbolic sign system to record this sort of information makes the interpretation of similar monuments rather difficult. On the other hand, it stimulates the emergence of a great number of arbitrary interpretations. This kind of interpretation can be regarded as justified and sufficiently reasoned if it takes into account different characteristic features of the object in their interrelation, i.e. its function, the structure of decor, composition and principles of mutual arrangement of different motifs, numerical characteristics, etc. In an interdisciplinary collaboration the task of an astronomer is to direct a historian of culture to search for rhythms, numerical parameters and similar features which are important in terms of astronomy. In that case knowledge of the mechanisms of coding different information in ancient cultures will make it possible to suggest to a historian a more or less detailed interpretation of the corresponding monuments.

In this connection, A. A. Gurshtein's hypothesis in particular, about the origin of the Zodiac and the character of the division of the sky into constellations which took place in antiquity is undoubtedly of interest (Gurshtein, 1992). The argument of this hypothesis and its verification can be made only on the basis of the complex use of astronomical and historico-cultural data proper.

The keynote of this hypothesis which now seems to be obvious enough but was not advanced before is the proposition that the idea of the zodiacal circle is not supposed to have its primordial division into twelve parts. No doubt, the connection of the formed Zodiac with the transit of the Sun during a year which consists

(approximately) of twelve lunar months has a hypnotizing effect as if evidence that there cannot be another number forming the zodiacal ensemble. It is also evident that in the history of the formation of the scale of notation of time the idea of a month must have been shaped very early since it was easy to watch the monthly lunar cycle adding to it the knowledge of the rhythms of the functioning of the female organism. However, one can admit with much certainty that the idea of a year as a space of time was formed not as a result of the summing up of twelve already well-known units, i.e. months, but rather on the contrary – a year was distinguished irrespective of lunar rhythms and only later was correlated with these rhythms and divided into twelve parts.

As to the idea of a year itself the initial support for its formation was the above-mentioned rhythm of seasonal changes in nature but the idea of a distinct connection with a calendar was obtained only by coordination with the laws of the yearly solar cycle and the first step taken in connection with this was singling out the four supporting points of this cycle – equinoxes and solstices, the very quartet in the idea on which A. A. Gurshtein's hypothesis is based. In all probability the distinguishing of the times (and points) of solstices was simpler and earlier in time, but it is doubtful whether in the history of culture this achievement was much ahead of the next step – the distinguishing of the points and times of the equinoxes. There is a very close connection between the spring and autumn temporal benchmarks and the cardinal moments of the cycle of a household must have stimulated it. It is worth mentioning that it is the perception of the four cardinal turning points which favoured the formation of the idea of the four above-mentioned directions of the world which was vital to an ancient man and thus gave an opportunity for structuring not only time but space in order to coordinate spatial and temporal structures. It is no coincidence that ancient structures and especially ritual and cultic ones associated with calendar ceremonies have a clear sub-square lay-out with a rather distinct orientation to the cardinal points (Antonova, 1984).

It is natural that the four clue-giving times of the yearly solar cycle and, correspondingly, the sections of the starry sky on which at these times the position of the sun falls must have been perceived within the framework of a mythological model of the universe. Hence, we have the semantics of the first quartet of names of the zodiacal constellations convincingly reconstructed by Gurshtein. "Semantic series" (chains of semantically simple symbols referring to various codes of the description of the universe) of "winter – the Lower World – water" or "summer – fruition – woman" type really run through the whole system of the archaic perception of the world.

All the above-mentioned make it possible to conclude that Gurshtein's hypothesis according to which the first stage of the Zodiac formation was the distinguishing of only four constellations named in accordance with the mythology which marks the position of the Sun in the periods adjacent to the key moments of the yearly solar cycle seems to be quite true in view of general tendencies of the development of the perception of ancient man. The subsequent stages of the process of the formation of the zodiacal ensemble are considered by the author of the hypothesis as a twofold distinguishing of new quartets bearing the same function and identical semantics.

This process took place as the Sun because of precession changed its positions at cardinal moments of a year to other points of the ecliptic. As a result the number of Zodiacal constellations attained twelve.

This hypothesis seems to be especially valuable due to the fact that both the cultural-historical and astronomical arguments proper, such as a size criterion of Zodiacal constellations (with the older the quartet the larger area of constellations in it) are taken into account. Regarding its evaluation in terms of the history of culture its various aspects are convincing to a marked degree. Hence, the idea of the semantic similarity of names of constellations which mark the position of the Sun at the key moments at different stages is well confirmed by the material of "winter" constellations: the names of Pisces, Aquarius and Capricornus are mono-semantically characterized by their connection with the element of water which in ancient cultures was firmly associated with winter and the world of death. In this connection the fact is worth mentioning that in an ancient Mesopotamian calendar the name of the month on which the winter solstice falls means "sinking" (of the Sun?) (Dyakonov, 1990). In other cases the semantic similarity of astronomical triads and their association with the perception of the corresponding spaces of time (Gemini, Taurus, Aries – spring, creation; Virgo, Leo, Cancer – summer, fertility, apotheosis of nature, the beginning of the return; Sagittarius, Scorpio, Libra – autumn, dying) are far from being so evident, although one must take into consideration that a multiple meaning of semantics of mythological images is not excluded. Generally speaking Gurshtein's hypothesis requires a purposeful analysis of mass archaeological and historical material from a culturo-historical point of view. The absence of data in sources directly confirming a hypothesis should not always be interpreted as its refutation. In this connection the question of the emergence of Zodiacal constellation names itself arises. The author of the hypothesis is right in affirming their considerable conservatism and it is not only a question of the principal orientation of ancient cultures in a tradition pointed out by Gurshtein but mainly the question is not of astronomical stability but rather semantic stability caused by joining these semantics to a complete mythological picture of the world. So that is why even when written sources demonstrate the availability of names of Zodiacal constellations in ancient times which do not coincide with those known to us this fact does not exclude ancient sources of the present astronomy. Specialists have pointed out four ways for the transition from the most ancient Mesopotamian names of constellations and heavenly bodies to the classical ones of the later period: "(1) echoing, or full translation of Sumero-Akkadian terms, (2) shift of meaning or interpretation of the latter, (3) lexical, or "material" borrowing, and (4) folk etymology, or misinterpretation" (Bobrova and Militarev, 1993). Nevertheless, another way should be taken into account – the actualization of another element of the same "semantic series" to which the fixed ancient name belongs, and on the basis of that the emergence of a new astronym by recoding but keeping the semantics unchanged. Thus, even adopting the thesis that the name of Aries began by the designation of the corresponding Zodiacal constellation only among the Greeks, while in Sumerian and later in Babylon it was called Mer-

cenary (Militarev, 1995), one cannot ignore the fact that in Mesopotamia this constellation was associated with the god Dumuzi whose symbol according to the wide-spread scientific idea was a ram, and in that way deep roots of a new, at first glance, name were formed. The same thing can be said about the name of Aquarius emerging from late verbal sources. But this can be viewed from another aspect if one thinks of this image in the Mesopotamian tradition in antiquity as the so-called deity with water streams presented in numerous figurative monuments.

There are different ways of verifying Gurshtein's hypothesis on the grounds of historico-cultural data. Of much importance could have been the revelation of ensembles of symbols in ancient monuments where each symbol corresponds to a symbol from each of the Zodiacal quartets. Such cases are known (see, for example, the representation of symbols corresponding to the last quartet (according to Gurshtein) on the body of a lion-headed statue of the so-called Mithra which was found in Rome). A purposeful analysis can, probably, bring to light similar cases including those of an earlier period. Of no less significance is the following consideration. If one accepts the hypothesis concerning the formation of the Zodiac divided into twelve parts by means of the consequent adding of new quartets to the four initial constellations there must exist monuments which give evidence for the intermediate stage of this process, the stage which began with the introduction of the second quartet – the division of the solar year into eight parts. The traces of a similar division have already been mentioned by specialists (Pingree and Reiner), but only Gurshtein's hypothesis about the formation of the Zodiac gives a convincing explanation of this fact.

Unquestionably deserving of special attention is a well-known mirror of the Scythian period revealed at the mound of Kelermes in the Kuban region (Scythian Art, 1986). The surface of its reverse is divided into eight equal sectors. The subject of the depiction in them allowed, in due course, the author of this article to assume that they were connected with the solar cycle, including the times of equinoxes and solstices (Raevsky, 1988). Gurshtein's work greatly contributed to this interpretation and at the same time introduced certain amendments to it. It is worth noticing that the symbol of one of the solstices here, according to this suggested interpretation, is a figure of a female deity which can be correctly correlated with a mythological person who gave the name of Virgo to a constellation. In the contemporary solar cycle this constellation is not connected with the time of the summer solstice but in Gurshtein's reconstruction such a situation is typical for the epoch of the first solar quartet. In this period the mirror which made this connection was already an anachronism but mythology evidently held it in remembrance. At the same time the symbolism of the second quartet is also represented in this monument, thus defining the structure of the quartet as consisting of eight parts. A purposeful analysis of the mass of material in the form of figures belonging to different epochs and cultures can, probably, increase the number of monuments reflecting the analogous situation.

Undoubtedly not all aspects of Gurshtein's hypothesis are equally convincing and many of them require additional analysis which can scientifically prove or dis-

prove it. But this kind of critical analysis is possible only by the common efforts of astronomers and historians of culture and therefore, the discussion of this very hypothesis appears to be an optimal "firing ground" for the collaboration of representatives of such remote, at first glance, fields of human knowledge.

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